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(54) **SYSTEM AND METHOD OF LOCATING INSTALLED DEVICES**

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CPC H04N 23/66; G08B 13/19641; G08B 13/19697; G08B 27/003; G08B 25/016;
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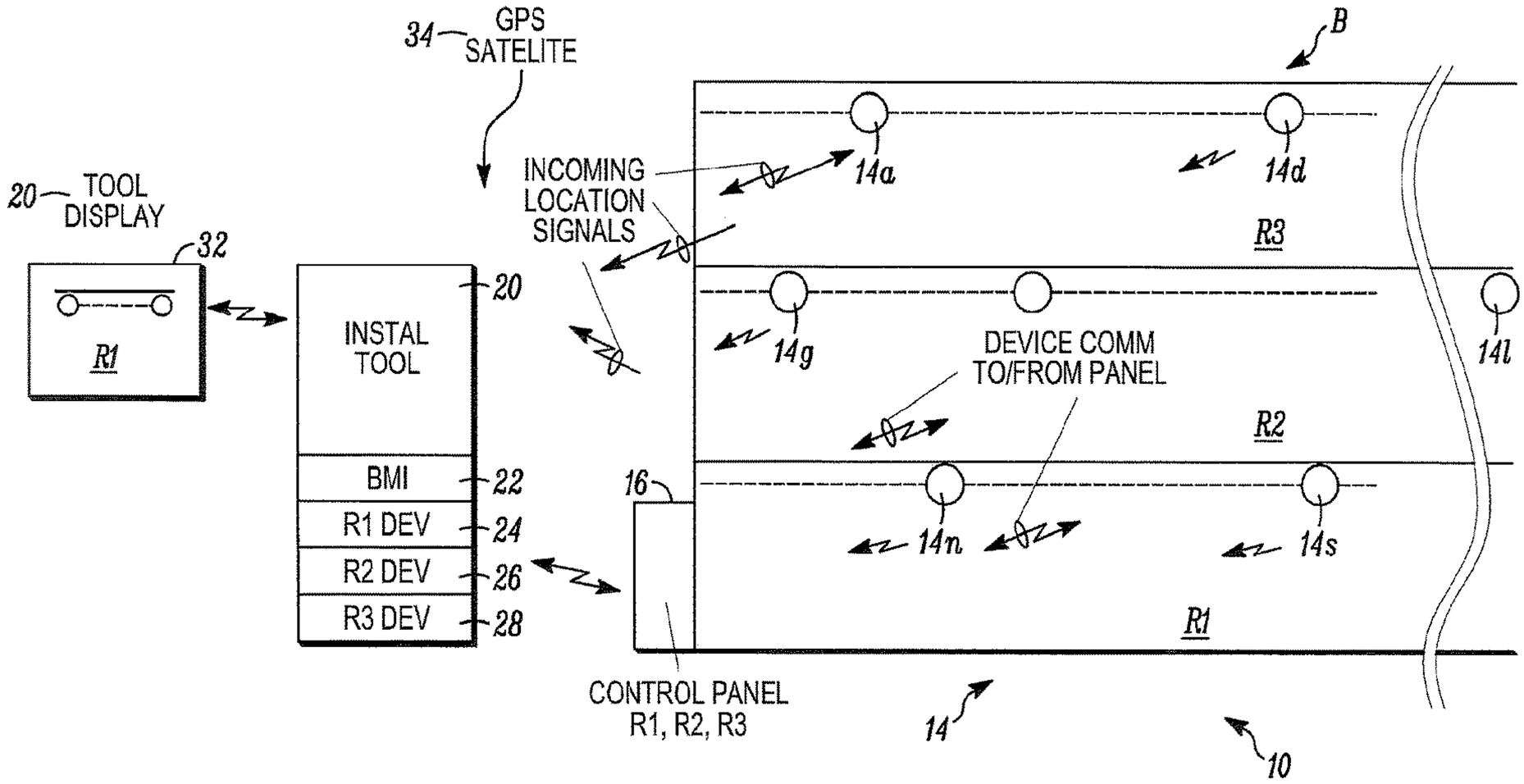
(57) **ABSTRACT**

A graphically based tool and method for generating programming for a fire monitoring system. The locations of existing devices, such as detectors, in a building being monitored, can be visually presented in the context of the building. New devices can be installed, or the location of existing devices changed since all devices report their locations in the building to the tool. Device location information can be combined with building information to create a multi-dimensional representation of parts of the building being monitored.

20 Claims, 2 Drawing Sheets



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See application file for complete search history.

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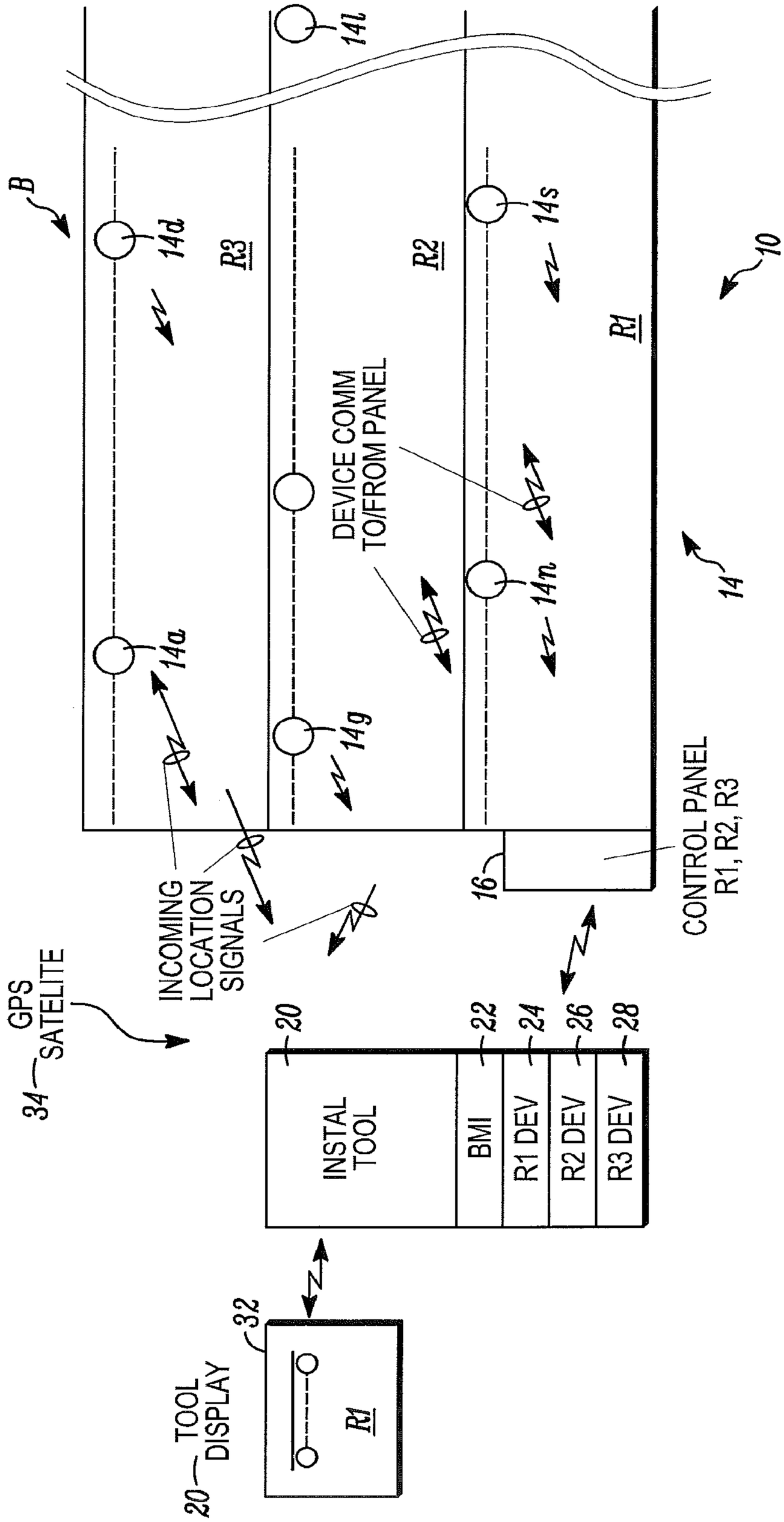
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R3
14l
R2
14s
R1
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14g
14n
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CONTROL PANEL
R1, R2, R3
INCOMING
LOCATION
SIGNALS
GPS
SATELITE
34
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BMI
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R1 DEV
26
R2 DEV
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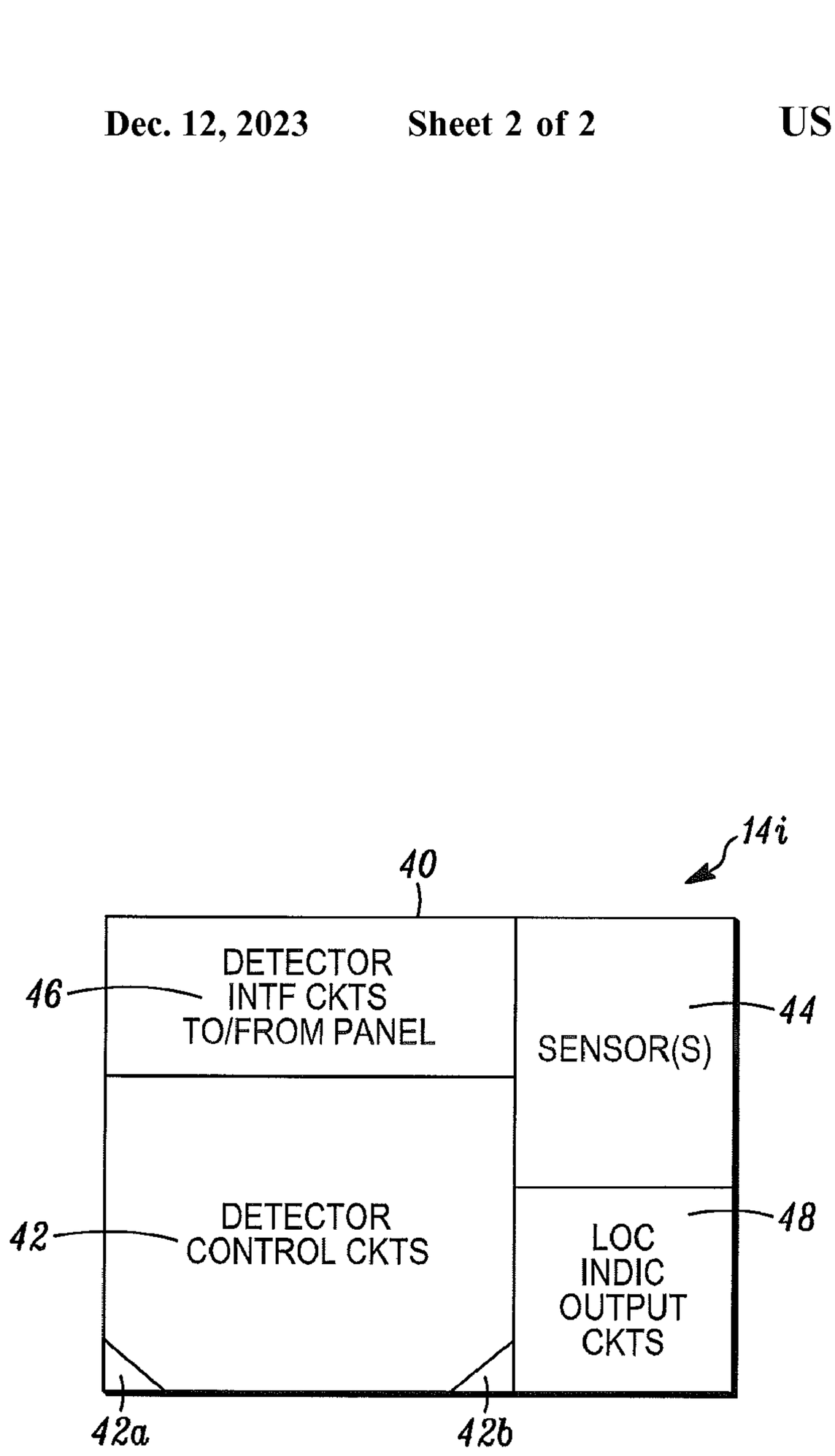
R3 DEV
TOOL
DISPLAY
32
R1

FIG. 1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INTF CKTS
TO/FROM PANEL
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SENSOR(S)
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DETECTOR
CONTROL CKTS
42
LOC
INDIC
OUTPUT
CKTS
48
42a
42b

FIG. 2

SYSTEM AND METHOD OF LOCATING INSTALLED DEVICES

PRIORITY INFORMATION

This application is a Continuation of U.S. application Ser. No. 16/856,896, filed on Apr. 23, 2020, and will issue as U.S. Pat. No. 11,508,232 on Nov. 22, 2022, which is a Continuation of U.S. application Ser. No. 14/656,244, filed on Mar. 12, 2015, and issued as U.S. Pat. No. 10,635,411 on Apr. 28, 2020, the contents of which are incorporated herein by reference.

FIELD

The application pertains to control systems and methods of managing large numbers of detectors used in monitoring regions of interest. More particularly, the application pertains such systems and methods which provide tools which can be used to locate and provide visual representations of devices in a region of interest, as well as visually assisting in the installation or altering of locations of devices in such systems.

BACKGROUND

Fire, security and building control systems are complicated and time-consuming to program and install. Extensive planning is required to ensure that addressable devices are installed in precise locations, so that they may be programmed to cooperate in a specific manner with each other during fires or other emergencies. Installers must take time and care to install and address the systems according to a specific engineering plan, or it will not operate correctly.

Current systems use programming methods text-based. Text-based programming requires that a plethora of information be programmed for each device in the system. Text-based programming offers no visual feedback to the programmer of the physical space being programmed. Text-based programming may not be easily interpreted by someone unfamiliar with the site or site layout.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a block diagram of a system in accordance herewith; and

FIG. **2** is a diagram of a detector usable in the system of FIG. **1**.

DETAILED DESCRIPTION

While disclosed embodiments can take many different forms, specific embodiments thereof are shown in the drawings and will be described herein in detail with the understanding that the present disclosure is to be considered as an exemplification of the principles thereof as well as the best mode of practicing same, and is not intended to limit the application or claims to the specific embodiment illustrated.

In one aspect, embodiments hereof reduce the time to program the fire, security, building management or other systems by providing the installer with an accurate, 3-D visual representation of the installed system. The installation time is reduced by eliminating the need to specify and follow addressing requirements for the devices.

A unique location identifying system provides information as to the precise location of installed devices. Device location is combined with satellite or other types of aerial imagery and/or Building Information Modeling (BIM) to obtain a detailed installation configuration, including the physical locations of all of the enabled devices within an installation.

In one embodiment, an installer can use the graphical representation of the system to generate the programming for the applicable system. An installation tool can create more accurate default programming than can current systems. By selecting devices with a tool which knows the location of each device the system installer can more quickly and accurately program a complex system.

In another aspect, an installer can view a precise location in space for an active device or devices, rather than a text description which may not be properly interpreted. The tool can use BIM and system feedback to direct the installer, or anyone else, through the building or site to the location in question. For example, directing the user to the proper staircase to be used to reach the desired location, rather than just providing spatial coordinates.

In another aspect, the system can be used with BIM information and inhabitant tracking to provide up to date directions for people on-site who need to be evacuated or directed to a certain area. In this case the location of active devices can be interpreted by the system, which would then select the most efficient way for individuals in the region to avoid an emergency or to reach a desired location. This information could be presented in many ways, including but not limited to audio messaging, SMS messages, and signage.

In yet another aspect, device location information can be provided by circuitry developed to track first responder locations in buildings during an incident. A variety of such responder tracking systems are publicly available, as would be known by those of skill in the art. One example is the publicly disclosed Geo-spatial Location, Accountability and Navigation System for Emergency Responders, GLANSER. responder locating system. Technology such as, but not limited to, that used in the GLANSER locating system can be incorporated into fire alarm, security, building control or other devices to provide their respective locations to a local position monitoring system of the type disclosed herein. A tool can retrieve the location of all the devices installed in the system. That information can be used to build a 3-D map of the region of interest. That 3-D map can be combined with BIM and aerial imagery to create a virtual map of the region and the local fire detection system.

The virtual map could then be used in a graphical installation tool with a graphical user interface. The interface enables the user to highlight physical space and program attributes common to fire alarm, security or other systems, to the devices or a subset of devices in that space. This advantageously provides a more user-friendly graphical interface for system control, and, makes the system easier to program and diagnose than one requiring text-entry of information for all devices.

The map could also be used to direct first responders to the proper location, show possible obstacles between the user and the objective, to direct other people within an installation to the proper location (exits, safe rooms, etc.), show the location of hidden/obstructed devices for maintenance or other purposes, or be used for additional applications.

FIG. **1** illustrates aspects of a configuration **10** of the type above. In FIG. **1**, a building B has three floors, regions R**1**, R**2**, and R**3**. Members of a plurality **14** of detectors or other devices useful in an alarm system are installed throughout those regions. The members of the plurality communicate with a control panel **16** as would be understood by those of

skill in the art. Advantageously, each of the detectors such as **14***i*, includes position identifying circuitry of the type described above.

Configuration **10** includes an installation tool **20** which obtains the location information from each of the members of the plurality **14**. Tool **20** can be implemented with circuitry to receive the incoming position signals, along with a BMI model **22** and storage **24**, **26**, **28** to receive location and other information from detectors, or devices from the plurality **14**.

The tool **20**, as described above, can implement a 3D-type display of some or all of regions R**1**, R**2** and R**3** along with locations and information as to members of the plurality **14**, Tool **20** can present such displays on local graphical user interface, and display device **32**.

Data can also be acquired by the tool **20** via GPS satellite **34**. Such data, while useful, does not include information or photos within closed structures.

FIG. **2** illustrates an exemplary member **14***i* of the plurality **14**. Detector **14***i* includes a housing **40** which carries control circuits **42**. The control circuits **42** can be implemented, at least in part with one or more programmable processors **42***a* and associated executable control software **42***b*.

Housing **40** also carries one or more sensors **44**, coupled to control circuits **42**. Sensors **44** could include, without limitation, fire related sensors, such as smoke, flame or heat sensors. Alternately, sensors **44** could include gas sensors, or security related sensors.

Housing **40** also includes detector interface circuits for communication with the control panel **16**. Such communications could be via wired or wireless mediums. Housing **40** can also carry location indicating output circuits and transceivers, radios for example, for automatically emitting position information to be detected by the tool **20**. Such position information for the regions Ri can be stored, and updated by tool **20**, in storage elements **24**, **26**, **28**.

Those of skill will also understand that the plurality **14** can include output devices, for example audio or visual output devices, or control elements such as door locks, fan or heating controls or the like without limitation.

In summary, as described above, the members of the plurality **14** will update and automatically emit location information for the respective device. The locations of existing devices, such as detectors, in a building being monitored, can be visually presented in the context of the building. New devices can be installed, or the location of existing devices changed since all devices report their locations in the building to the tool. Device location information can be combined with building information to create a multi-dimensional representation of parts of the building being monitored.

From the foregoing, it will be observed that numerous variations and modifications may be effected without departing from the spirit and scope hereof. It is to be understood that no limitation with respect to the specific apparatus illustrated herein is intended or should be inferred. It is, of course, intended to cover by the appended claims all such modifications as fall within the scope of the claims. Further, logic flows depicted in the figures do not require the particular order shown, or sequential order, to achieve desirable results. Other steps may be provided, or steps may be eliminated, from the described flows, and other components may be add to, or removed from the described embodiments.

The invention claimed is:

1. A method comprising:

programming an attribute of a device in response to the device being within a first area of a building;

receiving location information including a location of the device emitted from the device that has changed locations from the first area to a second area of the building;

displaying an updated multi-dimensional representation of the first area and the second area of the building including the location of the device visually presented in context of the building on a user interface;

receiving a selection via the user interface of the updated multi-dimensional representation of the second area; and

programming a different attribute of the device in response to the device being within the second area.

2. The method of claim **1**, further comprising receiving location information from another device that has been installed.

3. The method of claim **1**, further comprising receiving a selection via the user interface of the updated multi-dimensional representation of the first area.

4. The method of claim **3**, further comprising programming an attribute of each of one or more devices in response to the one or more devices being within the first area.

5. The method of claim **1**, further comprising directing a user via the updated multi-dimensional representation of the first area and the second area of the building to a location.

6. The method of claim **1**, further comprising tracking inhabitants via the updated multi-dimensional representation of the first area and the second area of the building.

7. An apparatus comprising:

a control circuit configured to:

receive location information including a location of each of one or more devices emitted from each of the one or more devices of a fire alarm system that have been installed in a building;

receive location information including a location of a device emitted from the device of the one or more devices of the fire alarm system that has changed locations from a first area to a second area of the building; and

implement a multi-dimensional representation of the first area and the second area of the building including the location of the one or more devices visually presented in context of the building; and

a user interface configured to:

receive a selection of the multi-dimensional representation of the first area prior to receiving the location information including the location of the device that has changed locations from the first area to the second area of the building;

program an attribute of the device in response to the device being within the first area;

receive a selection of the multi-dimensional representation of the second area subsequent to receiving the location information including the location of the device that has changed locations from the first area to the second area of the building; and

program a different attribute of the device in response to the device being within the second area.

8. The apparatus of claim **7**, further comprising a storage element.

9. The apparatus of claim **8**, wherein the storage element is configured to store the received location information from each of the one or more devices of the fire alarm system that have been installed in the building.

10. The apparatus of claim **8**, wherein the storage element is configured to store the received location information from the device that has changed locations from the first area to the second area of the building.

11. The apparatus of claim **7**, wherein the control circuit is configured to directly receive the location information from each of the one or more devices of the fire alarm system that have been installed in the building via wired or wireless mediums.

12. The apparatus of claim **7**, wherein the control circuit is configured to directly receive the respective location information from the device that has changed locations from the first area to the second area of the building via wired or wireless mediums.

13. The apparatus of claim **7**, wherein the control circuit is configured to receive data via a Global Positioning System (GPS) satellite.

14. A system comprising:

a plurality of devices of a fire alarm system of a building; and

an installation tool comprising:

a control circuit configured to:

receive location information including a location of a device emitted from the device of the plurality of devices that has changed locations from a first area to a second area of the building; and

implement a multi-dimensional representation of the first area and the second area of the building including the location of the plurality of devices visually presented in context of the building; and

a user interface coupled to the control circuit, wherein the user interface is configured to:

display the multi-dimensional representation of the first area and the second area of the building;

receive a selection of the multi-dimensional representation of the first area prior to receiving the location information including the location of the device that has changed locations from the first area to the second area of the building;

program an attribute of the device in response to the device being within the first area;

receive a selection of the multi-dimensional representation of the second area subsequent to receiving the location information including the location of the device that has changed locations from the first area to the second area of the building; and

program a different attribute of the device in response to the device being within the second area.

15. The system of claim **14**, wherein each of the plurality of devices include location indicating output circuits and transceivers.

16. The system of claim **15**, wherein each of the location indicating output circuits and transceivers are configured to emit location information to the installation tool.

17. The system of claim **15**, wherein the location indicating output circuits and transceivers are radios.

18. The system of claim **14**, wherein each of the plurality of devices include one or more sensors.

19. The system of claim **14**, wherein the first area is a first floor and the second area is a second floor.

20. The system of claim **14**, wherein each of the plurality of devices comprise interface circuits configured to communicate with a control panel.

* * * * *